SP400RF

Radio Frequency Handheld Laser Scanner



Programming Guide

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Disclaimer

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INTRODUCTION

This manual contains instructions for changing interfaces, barcodes for customizing the ***SP400RF*** scanner's operation and a listing of standard factory settings. It is important to note that many of the features and programming labels contained here are identical to those available for other ***SP400*** models. Since the ***SP400RF*** contains software enhancements and characteristics that set it apart from other models, it is recommended that this guide be used as the sole source of programming labels and information (except for other ***SP400RF*** product-specific publications).

The organization of this manual is intended to support a variety of users while making it quick and easy to find the information you need. Look at the descriptions that follow to find where to go from here.

I NEED TO UNDERSTAND THE BASICS

If you do not regularly use barcode labels to configure (program) scanners, it will be very helpful to read the introductory portions of this manual prior to beginning your programming session. In addition to the information that follows, information of specific interest to you is titled:

- Integrating Peripherals with Host Systems
- Changing Interfaces
- Customizing Your Scanner Operation
- Programming Overview
- What is Programming Mode?
- How to Program Using Barcodes
- The Programming Session
- Scanner Response When in Programming Mode
- If You Make A Mistake
- Where to Go From Here

INTEGRATING PERIPHERALS WITH HOST SYSTEMS

It is important that you understand that the scanner must contain software that supports a specific interface in order to use that interface.

Next, turn to Appendix A, *Standard Factory Settings*, which contains a complete factory default configuration listing. Assuming that your scanner is configured using the standard factory settings, use this list to identify any changes or additions you need to make.

Then, locate the programming labels you need and change the necessary settings. Once you have completed these steps, you can begin scanning.

Changing Interfaces

The scanner is configured at the factory to support one of two interface groups listed in Table 1 below. Changing the current interface is simply a matter of selecting the desired interface from your scanner's group, and enabling the new interface using the programming labels contained in this guide.

Table 1. SP400RF Interface Groups

RS-232 • IBM • OCIA Group	RS-232 • Wand Emulation • Keyboard Wedge Group
RS-232	RS-232
SNI RS-232	SNI RS-232
IBM 468x/9x Port 5B	Wand Emulation
IBM 468x/9x Port 9x	Type A — PC/XT w/foreign keyboard
IBM 4682/92 Port E	Type B — AT, PS/2 25-286, 30-286, 50, 50Z, 60, 70, 80, 90 & 95 w/foreign keyboard
PSC[1] OCIA	Type C — PS/2 25 and 30 w/foreign keyboard
NCR OCIA Eight Bit	Type D — PC/XT w/US keyboard
NCR OCIA Nine Bit	Type E — AT, PS/2 25-286, 30-286, 50, 50Z, 60, 70, 80, 90 & 95 w/US keyboard
SNI OCIA	Type F — PS/2 25 and 30 w/US keyboard
	STI keyboard wedge

NOTE

If you attempt to select an interface that is not supported by your scanner, or if the scanner's interface hardware malfunctions, all three LEDs will flash five times and the scanner will automatically reset to the standard RS-232 interface. The scanner will otherwise be returned to normal function.

Once you have enabled the new interface with the appropriate label, the new interface becomes the default interface that is active whenever power is applied to the scanner.

The following steps describe the interface change procedure.

1. Turn to the appropriate page in this manual and scan the desired interface enable programming label. This will enable the software for the new interface and disable the 'old' interface software.
2. Scan a barcode to verify that the scanner communicates correctly with the host system. Some sample barcodes are provided on the last pages of this manual. If any changes to the scanner's factory settings are needed, use the instructions titled, *Customizing Your Scanner Operation.*

1 Formerly titled: "Spectra-Physics OCIA" or "S-P OCIA".

CUSTOMIZING YOUR SCANNER OPERATION

When enabling a new interface, it may be necessary to modify the standard factory settings to match your specific host system's communication and symbology requirements. Check with your system administrator to identify your host system's specific interface requirements to ensure that they match the new interface you have selected. Also, the scanner's operational features (e.g. speaker volume, radio channel frequency, etc.) can be customized to match your unique requirements.

1. Use the labels in this manual to modify the standard configuration to match your specific interface requirements or user preference.

> **NOTE**
>
> *Ensure that your planned modifications are compatible with the current interface. For example, baud rate selections are only valid in the RS-232 interface. The scanner will read and seem to accept programming labels for features invalid to the current interface, however the feature will not be modified.*

2. Enable any additional symbologies as required and exit Programming Mode.
3. Scan a regular barcode label and verify that the scanner and host communicate correctly.
4. You have completed the factory settings change procedure.

If you experience difficulties, have questions or require additional information, contact your local distributor using the listings located on the back cover of this guide.



PROGRAMMING OVERVIEW

This section describes how to set the scanner's programmable features. These features can be configured using the barcode labels contained in this manual or by using commands sent from the host. Refer to Appendix B, *Additional Information*, for host programming details. If you program the scanner using these barcodes, the scanner stores the changes until reprogrammed. Whenever you use these labels to change programmable features, you are changing these features for the active interface only.

WHAT IS PROGRAMMING MODE?

To change the scanner's programmed settings, it is necessary to place the scanner in Programming Mode using the special "set" label. This ensures that the scanner only recognizes the special programming labels contained in this programming guide.

HOW TO PROGRAM USING BARCODES

The following pages contain special barcode labels that are used to change or enable the scanner's programmable options. All programming sessions follow this order, unless otherwise instructed:

NOTE

Programming should be performed with the base station in near proximity to ensure optimal communication and sllow the user to monitor the base station's LED indicators.

1. **Scan the SET label at the top of the page**. The scanner will emit two beeps indicating it has read the label, and the base station's red LED will begin flashing. As long as the lamp is flashing, the scanner will only recognize and decode programming labels.
2. **Scan the feature label(s) for the programmable options you wish to enable.** The scanner will emit two beeps each time you scan a valid label. (Note that not all features are available for all interfaces.) The first beep indicates that the scanner has read the label, the second announces base station acknowledgement of the label.
3. **Scan the END label at the bottom of the page** to complete the programming session and exit Programming Mode.

The Programming Session

It is possible to program multiple features during a single programming session (a programming session is defined as the period of time between scanning the "set" label and scanning the "end" label). However, it is recommended that sessions be limited to one feature, as it can be difficult to discover where an error has been made, should you make a mistake in the programming sequence. Additionally, it can be confusing to determine which features may or may not have been successfully set following a failed session.

The scanner will not exit Programming Mode unless the "end" label is scanned. Disconnecting power during Programming Mode, before scanning the "end" label, will cause the scanner to forget any programming labels scanned during the current programming session and will cause the scanner to return to its previous settings.

Scanner Response When In Programming Mode

Visual verification that the SP400RF is in Programming Mode is provided by the red LED located on the base station, which will steadily flash until Programming Mode is exited. While in Programming Mode, the scanner will not decode regular barcode labels and will only enable features supported by the currently active interface. Maintaining a good record of all changes made will help ensure that you know if the standard factory settings have been changed.

Scanning regular barcode labels — the scanner will reject the label, sounding first a "good read" beep, followed by a low "bad" beep.

Scanning a valid programming label —

a. If the feature is supported by the active interface, the scanner will sound two "good read" beeps.

b. If incomplete or incorrect programming has been entered when the END label is scanned, the rejection tone will be sounded (a "good read" beep, followed by a low "bad" beep) regardless of whether the labels scanned were valid programming labels. For example, if the END label is scanned immediately following the SET label, the lack of programming content will result in a rejection tone.

If You Make a Mistake…

If, during a programming session, you find that you are unsure of the scanner's settings or wish to re-set the scanner's configuration, use the Return to Factory Settings label on this page to return the scanner's configuration to the factory settings. Scanning this label will reset any changes made during a previous programming session.

Appendix A contains a complete list of all standard factory settings.

> **WARNING**
>
> *After returning the scanner to factory defaults, you must scan the BASE STATION I.D. label (located on labels on the top and side of the base station) and the CONFIGURATION UPLOAD label as described below. This will reestablish the communication link between the scanner and base station, and complete the restoration of the scanner's original configuration.*

Return to Factory Settings

Scan this label to return the scanner to the factory settings for the active interface. It is unneccessary to scan "set" and "end" labels with this label.

Configuration Upload

Use this option to upload the configuration file from the base station to the scanner.

SET ------------------------------------

Upload Base Station Config -

END ------------------------------------

Where To Go From Here

Programming is easy and straightforward if you follow these steps:

1. Turn to Appendix A and review the factory settings for the interface you will be using.
2. Scan the interface enable barcode label if you are changing interfaces.
3. Scan any feature labels that are unique to the interface you are currently programming. These interface specific programming labels immediately follow each interface selection label.
5. Turn to the Symbology section if you are going to change any barcode symbologies or modify any symbology related features.
6. Turn to the General Features section of this guide if you wish to change or modify any of the scanner's other features.

Once the necessary changes have been made, and you have scanned the “end” label, you are ready to scan.

IBM 4683/84 • 4693/94 Port 5B Interface Selection[1]

Scan this label to enable the IBM 468x Port 5B interface[1].

IBM 4683/84 • 4693/94 Port 5B Settings

Data Format: Send As Code 39 — converts barcode data (UPC/EAN, add-ons, Code 93, Codabar, MSI/Plessey and Code 128) into Code 39 format before sending the data to the host.
These settings are for IBM 4683/84 • 4693/94 Port 5B interface ONLY.

Limit Command Set — is an option that causes the scanner to ignore 'enable scanner' and 'disable scanner' commands sent from the host.

Transmit Unsolicited Status[2] — when enabled, this option causes the scanner to transmit a status message to the host upon receipt of a "Set Normal Response Mode" (SNRM) command, and after scanner transmission of a "Non Sequenced Acknowledge" (NSA) response.

SET ------------------------------------

Data Format

Send as Code 39 ------------

Don't Send as Code 39------

Enable Limit Command Set ---

Disable Limit Command Set --

Transmit Unsolicited Status -

Don't Transmit Unsolicited Status

END ------------------------------------

1 Scanners manufactured prior to April 30, 1997 do not have IBM interfaces as a selectable option.
2 For this IBM interface, the setting for Unsolicited Status is normally Enabled.

IBM 4683/84 • 4693/94 Port 9A, 9B, 9C, 9E I/F Selection

Scan this label to enable the IBM 468x/9x Port 9x interface.

IBM 4683/84 • 4693/94 Port 9A, 9B, 9C, 9E Settings

Data Format: Send As Code 39 — converts barcode data (UPC/EAN, add-ons, Code 93, Codabar, MSI/Plessey and Code 128) into Code 39 format before sending the data to the host.

These settings are for IBM 4683/84 • 4693/94 Port 9A, 9B, 9C, 9E interface ONLY.

Limit Command Set — is an option that causes the scanner to ignore 'enable scanner' and 'disable scanner' commands sent from the host.

Transmit Unsolicited Status[1] — when enabled, this option causes the scanner to transmit a status message to the host upon receipt of a "Set Normal Response Mode" (SNRM) command, and after scanner transmission of a "Non Sequenced Acknowledge" (NSA) response.

SET ------------------------------------

Data Format

Send as Code 39 ------------

Don't Send as Code 39------

Enable Limit Command Set ---

Disable Limit Command Set --

Transmit Unsolicited Status -

Don't Transmit Unsolicited Status

END ------------------------------------

1 For this IBM interface, the setting for Unsolicited Status is normally Disabled.

IBM 4682/92 Port E Interface Selection

Scan this label to enable the IBM 468x/9x Port E interface.

IBM 4682/92 Port E Settings

Data Format: Send As Code 39 — converts barcode data (UPC/EAN, add-ons, Code 93, Codabar, MSI/Plessey and Code 128) into Code 39 format before sending the data to the host.

These settings are for IBM 4682/92 Port E interface ONLY.

Limit Command Set — is an option that causes the scanner to ignore 'enable scanner' and 'disable scanner' commands sent from the host.

Transmit Unsolicited Status[1] — when enabled, this option causes the scanner to transmit a status message to the host upon receipt of a "Set Normal Response Mode" (SNRM) command, and after scanner transmission of a "Non Sequenced Acknowledge" (NSA) response.

SET ------------------------------------

Data Format

Send as Code 39 ------------

Don't Send as Code 39------

Enable Limit Command Set ---

Disable Limit Command Set --

Transmit Unsolicited Status -

Don't Transmit Unsolicited Status

END ------------------------------------

1 For this IBM interface, the setting for Unsolicited Status is normally Disabled.

PSC[1] OCIA Interface Selection

Scan this label to enable the Spectra-Physics OCIA interface.

NCR OCIA Eight Bit (short format) Interface Selection

Scan this label to enable the NCR OCIA (short format) interface.

NCR OCIA Nine Bit (long format) Interface Selection

Scan this label to enable the NCR OCIA Nine Bit (long format) interface.

SNI OCIA Interface Selection

Scan this label to enable the SNI OCIA interface.

1 Formerly labeled: Spectra-Physics OCIA, or S-P OCIA.

OCIA Options

Use these labels to change the settings as desired. The following brief descriptions explain each selection.

Beep on Not on File — when enabled requires the scanner to beep when a label is scanned that is not on file. NCR 8 and 9 bit ONLY.

Host Commands — when enabled allows the scanner to accept commands directly from the host. All OCIA types.

Intercharacter Delay — refers to a pause, if any, between each character before being sent to the host. This time delay is used to control the flow of data from the scanner, but it should not be required for most applications. When enabled, OCIA intercharacter delay is set at 70µs. All OCIA types.

OCIA INTERFACES

SET

Beep On Not on File	Enable	
	Disable	
Host Commands	Enable	
	Disable	
Intercharacter Delay	Enable	
	Disable	

END

Go to the sections titled *Symbology Selection* and *General Features* in the back of this programming guide if you want to change any other factory settings for these interfaces.

Wand Emulation Interface Selection

Scan this label to enable the Wand Emulation interface.

Wand Emulation Settings

SET

Polarity	Space Low, Bar High	
	Space High, Bar Low	
Signal Speed	Low (660 µs)	
	High (330 µs)	
Data Format	Transmit in Normal Format	
	Transmit in C39 Format	
	Transmit in C128 Format	
	Transmit in C39 Full ASCII	

IDLE STATE	LOW	
	HIGH	
TRANSMIT A NOISE PATTERN BEFORE LABEL TRANSMISSION	TRANSMIT PRE-NOISE	
	DON'T TRANSMIT PRE-NOISE	
TRANSMIT C128 FUNCTION CHAR'S	ENABLE	
	DISABLE	

END

Go to the sections titled *Symbology Selection* and *General Features* in the back of this programming guide if you want to change any other settings for this interface.

RS-232 Interface Selection

Scan this label to enable the RS-232 interface.

SNI RS-232 Interface Selection

Scan this label to enable the SNI RS-232 interface.

Turn to the following pages to set the RS-232 communication parameters.

Communication Parameter	Page #
Baud Rate	16
Data Bits	17
Parity	17
Stop Bit(s)	17
Hardware Handshaking (CTS/RTS)	18
Software Handshaking (Xon/Xoff)	19
Intercharacter Delay	20

Go to the sections titled *Symbology Selection* and *General Features* in the back of this programming guide if you want to change any other factory settings for this interface.

Baud Rate

Use the barcodes on this page to select the communications Baud Rate. Only one Baud Rate selection may be active at any one time. The last Baud Rate label you scan during a programming session will be the setting that is stored when you scan the END label.

SET -----------------------------------

Baud Rate

= 1200 ---------------------

= 2400 ---------------------

= 4800 ---------------------

= 9600 ---------------------

= 19200 -------------------

= 38400 -------------------

END -----------------------------------

Data Format Table

There are many possible data format configurations for an RS-232 interface. Check your host system manual to find out your system's communications requirements. This table shows the acceptable format options.

Data Bits	Start Bit	Parity Bit(s)	Stop Bit(s)
Seven	1	0	2
Seven	1	1	1
Seven	1	1	2
Eight	1	0	1
Eight	1	0	2
Eight	1	1	1

Data Format Settings

The barcodes on this page can be used to select the data format configuration needed to communicate with your system.

SET

Parity

None

Even

Odd

Mark

Space

Stop Bits

One

Two

Data Bits

Seven Bits

Eight Bits

END

Handshaking

Review your system documentation to identify handshaking requirements, and use these labels to change the settings if required. The following brief descriptions explain each selection.

Hardware Control

CTS/RTS Flow Control — is hardware handshaking. The scanner activates the RTS (Ready to Send) line when it is ready to send data to the host. The scanner waits for an active Clear to Send (CTS) signal from the host before transmitting data. If hardware control is disabled, CTS/RTS communication will not take place. If the host deactivates the CTS line during data transmission, the host will receive additional characters for no more than 2msec[1].

CTS Scan Control — is also a hardware control. When scan control is enabled, label transmission is disabled until CTS is asserted and de-asserted.

1 Varies slightly depending upon baud rate selected.

Software Control

Xon/Xoff — this is software handshaking that allows the host to control data transmission. If the host sends an Xoff command to the scanner, the scanner will not send the barcode data until it receives an Xon command from the host. If the host sends the Xoff command during data transmission, the host will receive no more than two additional characters.

SET ------------------------------------

Hardware Control

Disable Hardware Control --

Enable CTS/RTS Flow Control -

Enable CTS Scan Control --

Xon/Xoff

Enable Xon/ Xoff ------------

Disable Xon/Xoff ------------

END ------------------------------------

Interface RS-232

Intercharacter Delay

Intercharacter Delay refers to the pause, if any, between each character before it is sent to the host. This time delay is used to control the flow of data from the scanner, but it should not be required for most applications. Use these labels to select the desired Intercharacter Delay.

SET ------------------------------------

Intercharacter Delay

= None -----------------------

= 10 milliseconds ------------

= 20 milliseconds ------------

= 30 milliseconds ------------

= 40 milliseconds ------------

= 50 milliseconds ------------

= 60 milliseconds ------------

= 70 milliseconds ------------

= 80 milliseconds ------------

Intercharacter Delay (continued)

Intercharacter Delay

= 90 milliseconds

= 100 milliseconds

END

PC Keyboard Wedge Interface Selection

The scanner supports six PC Keyboard Wedge interfaces. The table below defines the different interface selections.

I/F Type	PCs Supported
A	PC/XT w/foreign keyboard
B	AT, PS/2 25-286, 30-286, 50, 50Z, 60, 70, 80, 90 & 95 w/foreign keyboard
C	PS/2 25 and 30 w/foreign keyboard
D	PC/XT w/US keyboard
E	AT, PS/2 25-286, 30-286, 50, 50Z, 60, 70, 80, 90 & 95 w/US keyboard
F	PS/2 25 and 30 w/US keyboard

SET ------------------------------------

Interface (I/F) Type (see table above)

A ----------------------------

B ----------------------------

C ----------------------------

D ----------------------------

E ----------------------------

F ----------------------------

END ------------------------------------

Keyboard Wedge Interface

NOTE: If the transmission parameters are configured such that a label results in no actual data to send, the label will be accepted, beeped, and no data transmitted.
We recommend that you disconnect power before plugging/unplugging cables to avoid any possibility of equipment damage

PC Keyboard Wedge – Connect to a Laptop/No Keyboard Attached

If no keyboard is attached, the scanner must provide the acknowledge signal to the PC. In this case, enable the "Laptop/No External Keyboard" mode. If a keyboard is attached, enable "Keyboard Attached".

Laptop (integrated keyboard) — Scan the "Laptop/No External Keyboard" label below when the scanner is connected to a laptop computer or when the scanner is operated with no external keyboard attached.

PC (external keyboard) — If you move the scanner to a standard PC, change the setting to "Keyboard Attached".

Send Control Characters — When this feature is disabled, all ASCII characters except NUL (00h) are transmitted. Enabling this feature limits transmission of ASCII characters to the following:

- Only ASCII characters between 20h..127h, plus…
  - Carriage Return (CR=0Dh)
  - BackSpace (BS=08h)
  - Right Tab (HT=09h)
  - Left Tab (0Bh)
  - Esc (1Bh)

SET

Connect to Laptop or PC

Laptop/No External Keyboard

Keyboard Attached

Send Control Characters

Enable

Disable

END

Intercharacter Delay

Intercharacter Delay refers to the pause, if any, between each character before it is sent to the host. This time delay is used to control the flow of data from the scanner, but it should not be required for most applications. Use these labels to select the desired Intercharacter Delay.

Intercharacter Delay

SET

= None

= 5 milliseconds

= 10 milliseconds

= 15 milliseconds

= 20 milliseconds

= 25 milliseconds

= 30 milliseconds

= 35 milliseconds

= 40 milliseconds

= 45 milliseconds

= 50 milliseconds

Intercharacter Delay
(continued)

Intercharacter Delay

= 55 milliseconds ------------

= 60 milliseconds ------------

= 65 milliseconds ------------

= 70 milliseconds ------------

= 75 milliseconds ------------

= 80 milliseconds ------------

= 85 milliseconds ------------

= 90 milliseconds ------------

= 95 milliseconds ------------

= 99 milliseconds ------------

END ------------------------------------

STI Keyboard Wedge Interface Selection

Scan this label to enable the STI Keyboard Wedge interface.

IMPORTANT

When enabling the STI Keyboard Wedge interface, certain parameters must be set to ensure proper communication with the wedge. Reference the tables below for these requirements. When all required parameters have been set for the interface, the entire set of STI Keyboard Wedge programmable features can be accessed using either the Master® BB+ *Universal Programming Guide* or the *VS/HS Keyboard Wedge Programming Guide* (P/N R44-1343) available through your dealer.

	Section of this Manual		
RS-232 I/F	Label Transmit Format Config	General Features	Code 39 Symbology
Baud = 9600	Prefix = None	STX = None	Symbology = Enable
Parity = Even	Suffix = Carriage Return (0xOD)	ETX = None	Check Digit Calc = Don't Calculate
Stop Bits = 1	Label ID = None (except IBMXXXX. See below)	ACK /NAK for Labels = Disable	Check Digit = Don't Send
Data Bits = Seven		ACK /NAK for Commands = Disable	Start/Stop Character = Don't Send
Hardware Control = None		Label ON/OFF File = Disable	Read One Char Label = Disable
Xon/Xoff =Disable			C39 Min Length = 1
			C39 Full ASCII = Disable

IBMXXXX STI Wedge

The IBMXXXX STI Wedge has the exception that the Label ID must be enabled as a Prefix using the standard default value for the symbology to be used

Label Transmit Format Configuration Items
(RS-232 and Keyboard Wedge Interfaces Only)

If you need to send information in addition to label data, the scanner can be configured to transmit prefixes and/or suffixes as well as symbology specific identifier characters (Label I.D.).

Prefix & Suffix

If you need to send information in addition to label data, the scanner can be configured to transmit prefixes and/or suffixes as well as symbology specific identifier characters. As the examples below show, none, one or two symbology specific ASCII characters can be added to the beginning of label in addition to multiple prefix and suffix characters.

> **NOTE**
>
> *Using this feature requires a thorough understanding of your specific system requirements.*

The options available using this feature are:

- symbology specific (0 - 2) characters + label data

  PP + label data

- non-symbology specific characters (1-2) as a prefix + label data

  C_pC_p + label data

- label data + non-symbology specific characters (0-2) as a suffix

  label data + C_sC_s

- non-symbology specific characters (1-2) as a prefix + symbology specific characters (0-2) + label data

  C_pC_p + PP + label data

- symbology specific characters (0-2) + label data + non-symbology specific characters (1-2) as a suffix

  PP + label data + C_sC_s

- non-symbology specific characters (1-2) as a prefix + label data + non-symbology specific characters (1-2) as a suffix

  C_pC_p + label data + C_sC_s

- non-symbology specific characters (1-2) as a prefix + symbology specific characters (0-2) + label data + non-symbology specific characters (1-2) as a suffix

$$C_pC_p + PP + \text{label data} + C_sC_s$$

- if TRANSMIT LABEL ID AS SUFFIX is enabled (see the section titled, *Setting Symbology Specific Identifiers [Label IDs]*), there can also be: non-symbology specific characters (1-2) as a prefix + label data + symbology specific characters + non-symbology specific characters used as suffixes.

$$C_pC_p + \text{label data} + PP + C_sC_s$$

PP = symbology specific characters (Label I.D.)
C_pC_p = non-symbology specific ASCII characters used as prefixes
C_sC_s = non-symbology specific ASCII characters used as suffixes

SETTING NON-SYMBOLOGY SPECIFIC PREFIX(ES)

These characters will be added to the standard label format when your host system has specific and unique requirements for information added to the barcode label data before it is sent to the host. Identify your specific system requirements before adding or modifying these settings, then...

1. Look at the ASCII chart shown on page 33 and identify the ASCII character(s) and the corresponding Hex Code(s) for the ASCII characters you will use as prefixes.

   For example, if you are going to send two prefix characters as 'STX' (start transmit) and 'SP' (Space). The ASCII chart shows that 'STX' equals 02_{hex} and 'SP' equals 20_{hex}.

2. Scan the SET label.
3. Scan the SET PREFIX label on this page.
4. Scan the digits that correspond to the Hex Values.

   For the example in step four, scan 0, 2, 2, 0.

> **NOTE**
>
> *If you make a mistake, or lose your place while setting this option, scan the "end" label to exit Programming Mode. The scanner will sound a rejection tone (a "good beep" followed by a low "bad beep") to indicate that programming was incomplete, and the setting will remain as it was before entering Programming Mode.*

5. Scan END.

   You have added a two character prefix to all label data, regardless of label symbology, that will be added to the label data before it is sent to the host.

SET ------------------------------------

SET PREFIX --------------------

GO TO THE SECOND PAGE FOLLOWING THIS AND SCAN THE APPROPRIATE CHARACTERS BEFORE SCANNING THE END LABEL TO EXIT PROGRAMMING SESSION.

LABEL TRANSMIT FORMAT CONFIG

Setting Non-Symbology Specific Suffix(es)

These characters will be added to the standard label format when your system has specific and unique requirements for information added to the barcode label data before it is sent to the host. Suffix characters follow the label data.

Identify your specific system requirements before adding or modifying these settings, then...

1. Look at the ASCII chart shown on page 33 and identify the ASCII character(s) and the corresponding Hex Code(s) for the ASCII characters you will use as suffixes.

   For example, if you are going to send two suffix characters as 'BEL' (sound host tone) and 'ETX' (end transmission). The ASCII chart shows that 'BEL' equals 07_{hex} and 'ETX' equals 03_{hex}.

2. Scan the SET label.
3. Scan the Set Suffix label on this page.
4. Scan the digits that correspond to the Hex Values.

   For the example in step five, scan 0, 7, 0, 3.

> **NOTE**
>
> *If you make a mistake, or lose your place while setting this option, scan the "end" label to exit Programming Mode. The scanner will sound a rejection tone (a "good beep" followed by a low "bad beep") to indicate that programming was incomplete, and the setting will remain as it was before entering Programming Mode.*

5. Scan END.

   You have added a two character suffix to all label data, regardless of label symbology, that will be added to the label data before it is sent to the host.

SET ------------------------------------

Set Suffix -------------------

Go to the next two pages and scan the appropriate characters before scanning the END label to exit programming session.

SETTING A SINGLE CHARACTER PREFIX OR SUFFIX

To set one ASCII character as a prefix or suffix, follow steps one through four on the previous two pages (select prefix or suffix), then...

1. Scan the two digit Hex Code for that character. (e.g. 03, 8F, ...FF)

> **NOTE**
>
> *If you make a mistake, or lose your place while setting this option, scan the "end" label to exit Programming Mode. The scanner will sound a rejection tone (a "good beep" followed by a low "bad beep") to indicate that programming was incomplete, and the setting will remain as it was before entering Programming Mode.*

2. Scan the One Character Only label on the following page.
3. Scan the END label.

You have set a single character prefix or suffix.

SETTING PREFIX AND/OR SUFFIX CHARACTERS

> **NOTE**
>
> *You must scan the SET label and either the Set Prefix or Set Suffix label before using the labels on this page.*

0 ------------------------------

1 ------------------------------

2 ------------------------------

3 ------------------------------

4 ------------------------------

LABEL TRANSMIT FORMAT CONFIG

5 ----------------------------

6 ----------------------------

7 ----------------------------

8 ----------------------------

9 ----------------------------

A ----------------------------

B ----------------------------

C ----------------------------

D ----------------------------

E ----------------------------

F ----------------------------

ONE CHARACTER ONLY ---------

END ------------------------------------

LABEL TRANSMIT FORMAT CONFIG

ASCII Character Set

The table on this page shows a set of ASCII characters and their corresponding Hex Values. The Hex Values in this table are needed for setting symbology specific label identifiers, as well as enabling custom prefix and suffix characters.

ASCII Char.	Hex Value	ASCII Char.	Hex Value	ASCII Char.	Hex Value	ASCII Char.	Hex Value
nul	00	sp	20	@	40	`	60
soh	01	!	21	A	41	a	61
stx	02	"	22	B	42	b	62
etx	03	#	23	C	43	c	63
eot	04	$	24	D	44	d	64
enq	05	%	25	E	45	e	65
ack	06	&	26	F	46	f	66
bel	07	'	27	G	47	g	67
bs	08	(	28	H	48	h	68
ht	09	)	29	I	49	i	69
lf	0A	*	2A	J	4A	j	6A
vt	0B	+	2B	K	4B	k	6B
ff	0C	'	2C	L	4C	l	6C
cr	0D	-	2D	M	4D	m	6D
so	0E	.	2E	N	4E	n	6E
si	0F	/	2F	O	4F	o	6F
dle	10	0	30	P	50	p	70
dc1	11	1	31	Q	51	q	71
dc2	12	2	32	R	52	r	72
dc3	13	3	33	S	53	s	73
dc4	14	4	34	T	54	t	74
nak	15	5	35	U	55	u	75
syn	16	6	36	V	56	v	76
etb	17	7	37	W	57	w	77
can	18	8	38	X	58	x	78
em	19	9	39	Y	59	y	79
sub	1A	:	3A	Z	5A	z	7A
esc	1B	;	3B	[	5B	{	7B
fs	1C	<	3C	\	5C	|	7C
gs	1D	=	3D	]	5D	}	7D
rs	1E	>	3E	^	5E	~	7E
us	1F	?	3F	_	5F	del	7F

Setting Symbology Specific Label Identifiers (Label I.D.)

Symbology-specific label identifiers comprise one or two ASCII characters that can precede or follow barcode label data as it is transmitted to the host. The host uses these characters as a means of distinguishing between symbologies.

Industry standards have been established for symbology-specific label identifiers, and are listed in the table below. Factory default identifiers are preset to these standards for the ***SP400RF*** scanner.

Symbology	ID	Symbology	ID
UPC-A	'A'	EAN-8 (8 Add-on)	'FF'
UPC-E	'E'	EAN-13 (2 add-on)	'F'
EAN-8	'FF'	EAN-13 (5 Add-on)	'F'
EAN-13	'F'	EAN-13 (8 Add-on)	'F'
UPC-A (2 add-on)	'A'	Code 39	'*'
UPC-A (5 Add-on)	'A'	Codabar	'%'
UPC-A (8 Add-on)	'A'	Interleaved.2 of 5	'i'
UPC-E (2 add-on)	'E'	Standard.2 of 5	's'
UPC-E (5 Add-on)	'E'	Code 93	'&'
UPC-E (8 Add-on)	'E'	Code 128	'#'
EAN-8 (2 add-on)	'FF'	MSI/Plessey	'@'
EAN-8 (5 Add-on)	'FF'		

Table 1. Industry Standard Label Identifiers (all are prefixes)

To set symbology-specific label identifiers:

1. Look at the ASCII chart shown on the previous page and identify the ASCII character(s) and the corresponding Hex Code(s) for the ASCII characters you will use as identifiers. You will also need to determine whether the character(s) will need to be sent as a prefix or a suffix.

   For example: You need to change the label identifier prefix for UPC-A to 'A1'.

2. Scan the SET label below.
3. Scan either the TRANSMIT LABEL I.D. AS PREFIX or TRANSMIT LABEL I.D. AS SUFFIX, depending on your requirements.

   For our example, the 'transmit as prefix' label would be scanned.

Setting Symbology Specific Label Identifiers (Label I.D.) Continued

4. Scan the label representing the symbology whose label identifier you wish to modify.

   In our example, we would scan the 'UPC-A' symbology label.

5. Identify and scan the digits that correspond to the Hex Values.

   The hex values from the ASCII chart that correspond to 'A1' from our example are as follows: 41_{hex} = 'A', and 31_{hex} = '1'. Thus, we would scandigit programming labels in this order: 4, 1, 3, 1.

6. Scan the END label.

   In our example, you have changed the default label identifier prefix for UPC-A from 'A' to 'A1'.

SET ------------------------------------

Disable Label I.D. Control ----

Transmit Label I.D. as Prefix -

Transmit Label I.D. as Suffix -

Label Transmit Format Config

Label I.D. Symbology Selection

Set Symbology Specific Label Identifier for:

UPC-A ---------------------

UPC-A w/2 digit add-on ----

UPC-A w/5 digit add-on ----

UPC-A w/8 digit add-on ----

UPC-E ---------------------

UPC-E w/2 digit add-on ----

UPC-E w/5 digit add-on ----

UPC-E w/8 digit add-on ----

EAN-8 ---------------------

EAN-8 w/2 digit add-on-----

EAN-8 w/5 digit add-on-----

EAN-8 w/8 digit add-on-----

EAN-13 --------------------

Label I.D. Symbology Selection Continued

Set Symbology Specific Label Identifier for:

EAN-13 w/2 digit add-on ---

EAN-13 w/5 digit add-on ---

EAN-13 w/8 digit add-on ---

Code 39 ---------------------

Codabar ---------------------

Interleaved 2 of 5 -----------

Standard 2 of 5 -------------

Code 93 ---------------------

Code 128 --------------------

MSI/Plessey ----------------

How to Set Single Character Label I.D.

If you only want a single character identifier, follow this modified procedure for setting label identifier.

1. Look at the ASCII chart shown on page 33 and identify the ASCII character and the corresponding Hex Code for the ASCII character you will use as the symbology specific identifier.
2. Scan the SET label.
3. Scan the label identifier label for the symbology identifier that you are going to change.

   As an example, assume that you want to change the label identifier for EAN-8 from the default setting FF to the ASCII value 8. Scan the Set Symbology Specific Label Identifier barcode for EAN-8.

5. Identify the hex value that correspond to the ASCII character.

   In this example '8' equals 38_{hex}.

   Simply follow the hex value for '8' (38_{hex}) with the One Character Only label. This tells the scanner that '8' is a single digit label identifier.

6. Scan the barcodes values.

   For the example in step five, scan 3, 8, One Character Only on the following two pages.

NOTE

If you make a mistake, or lose your place while setting this option, scan the "end" label to exit Programming Mode. The scanner will sound a rejection tone (a "good beep" followed by a low "bad beep") to indicate that programming was incomplete, and the setting will remain as it was before entering Programming Mode.

7. Scan the END label.

   You have changed the default label identifier for EAN-8 from 'FF' to '8'.

Disabling Label I.D. for a Specific Symbology

This procedure is the same as setting a single character symbology identifier, except you should scan two zeros and the One Character Only labels before scanning the END label.

Symbology Specific Label Identifiers Characters

Use the labels on this page to change or modify symbology identifiers.

0 ----------------------------

1 ----------------------------

2 ----------------------------

3 ----------------------------

4 ----------------------------

5 ----------------------------

6 ----------------------------

7 ----------------------------

8 ----------------------------

9 ----------------------------

A ----------------------------

B ----------------------------

C ----------------------------

D ----------------------------

E ----------------------------

F ----------------------------

ONE CHARACTER ONLY ---------

END ------------------------------------

Symbologies

Symbology selection (barcode type) determines which symbologies the scanner will decode. The chart below shows the symbologies that are supported by each interface. Once you have identified the symbologies you wish to enable, turn to the following pages, enable those symbologies and set the data format options (e.g. check digit, start/stop characters) required by your host system for each symbology type. You must enable the symbology format options settings that are compatible with your host system.

The factory settings for each interface were chosen to meet the standard industry requirements and in most cases you will not need to change the symbology format settings. If you are unsure of your system requirements, test the scanner using the factory settings before making any changes.

SYMBOLOGIES SUPPORTED

INTERFACE TYPE	UPC/EAN	Code 39	Inter. 2 of 5	Std 2 of 5	Codabar	Code 93	Code 128	MSI/Plessey
IBM Port 5B	●	●	●		●	●	●	●
IBM Port 9B	●	●	●		●	●	●	●
IBM Port E	●	●	●		●	●	●	●
NCR OCIA (8 bit)	●							
NCR OCIA (9 bit)	●	●	●				●	
S-P OCIA	●	●	●		●	●	●	●
SNI OCIA	●	●	●		●	●	●	
RS-232	●	●	●	●	●	●	●	●
Wand Emulation	●	●	●	●	●	●	●	●
Keyboard Wedge	●	●	●	●	●	●	●	●

Symbology Options Overview

Enable All Symbologies — allows the scanner to auto-discriminate between all the symbologies in this list. Use this selection only if you must constantly read a wide variety of symbologies. Turn to the following pages for enabling additional symbology specific options.

Disable All Symbologies — disables all symbologies. The scanner will only recognize the programming labels contained in this manual while you are in Programming Mode.

Enable UPC/EAN — tells the scanner to recognize UPC-A, UPC-E, EAN-8, and EAN-13. If you enable this symbology, additional options for symbology expansion and reading add-ons are available. Allows selection of expansion and add-on options.

Enable Code 39 — selects Code 39 as an active symbology. Allows selection of Check Digit, Start/Stop and Single Digit options.

Enable Interleaved 2 of 5 — selects Interleaved 2 of 5 as an active symbology. Allows change of Check Digit or label format (fixed or variable length) options.

Enable Standard 2 of 5 — selects Standard 2 of 5 as an active symbology. Allows change of Check Digit or label format (fixed or variable length) options.

Enable Codabar — selects Codabar as an active symbology. Allows selection of Check Digit, Start/Stop character and format, or label format (fixed or variable length) options.

Enable Code 93 — selects Code 93 as an active symbology. The scanner is preset to recognize all Code 93 barcodes that have between 2 and 50 characters. Code 93 has no user selectable options.

Enable Code 128 — selects Code 128 as an active symbology. The scanner is preset to recognize all Code 128 barcodes that have between 2 and 50 characters. Code 128 has no user selectable options.

Enable MSI/Plessey — selects MSI/Plessey as an active symbology. Allows selection of Check Digit or label format (fixed or variable length) options.

Symbology Selection

The labels on this page allow you to enable or disable all symbologies.

> **NOTE**
>
> *If you enable a symbology that has additional features that should be set, turn to the pages that support that symbology and its programmable features.*

SET ------------------------------------

Enable All Symbologies ------

Disable All Symbologies[1] --------

Enable UPC/EAN -----------

Disable UPC/EAN ----------

Enable Code 39 --------------

Disable Code 39 -------------

1 Code 128 is always active for the purpose of reading programming barcode labels. Scanning the DISABLE ALL SYMBOLOGIES label or the DISABLE CODE 128 label disables decoding of all Code 128 non-programming labels.

Enable Interleaved 2 of 5 ---

Disable Interleaved 2 of 5 ---

Enable Standard 2 of 5 -----

Disable Standard 2 of 5 ----

Enable Codabar --------------

Disable Codabar -------------

Enable Code 93 --------------

Disable Code 93 -------------

Enable Code 128 ------------

Disable Code 128[1] -------------------

Enable MSI/Plessey ---------

Disable MSI/Plessey --------

END ------------------------------------

1 Code 128 is always active for the purpose of reading programming barcode labels. Scanning the DISABLE ALL SYMBOLOGIES label or the DISABLE CODE 128 label disables decoding of all Code 128 non-programming labels.

UPC/EAN Options

The information below provides a brief description of the programmable UPC/EAN features included on the following pages.

Expand UPC-A to EAN-13 — adds a leading zero to a UPC-A label which 'expands' the label to the EAN-13 data format. Selecting this feature also changes the symbology ID to match those required for EAN-13.

Expand UPC-E to UPC-A — expands UPC-E labels to UPC-A data format. Selecting this feature also changes the symbology ID to match those required for UPC-A.

If this feature and Expand UPC-A to EAN-13 are both enabled, label data will be sent to the host in EAN-13 label format.

Expand EAN-8 to EAN-13 — adds five zeros in front of an EAN-8 label. Data is sent in EAN-13 data format. Selecting this feature also changes the symbology ID to match those required for EAN-13.

Expand UPC-E to EAN-13 — expands UPC-E labels to EAN-13 data format. Selecting this feature also changes the symbology ID to match those required for EAN-13.

UPC-A or UPC-E and EAN-8 or EAN-13 Two and Five Digit Add-Ons

Optional — scanner will read UPC/EAN barcodes with or without add-ons.

Required — UPC/EAN barcodes must have add-on or label will not be read.

Disable — scanner will not recognize/read add-on portion of UPC/EAN labels, but will read the main body of the label.

Price/Weight Check Digit — provides options for enabling price/weight check digits. The feature includes selections for domestic four or five digit, and European four or five digit, as well as the option to disable the price/weight check.

UPC/EAN Expansion

Use these labels to enable or disable:

- Expand UPC-A to EAN-13
- Expand UPC-E to UPC-A
- Expand EAN-8 to EAN-13
- Expand UPC-E to EAN-13

SET

UPC-A to EAN-13 Expansion	Expand[1]	
	Don't Expand	
UPC-E to UPC-A Expansion	Expand[1]	
	Don't Expand	
EAN-8 to EAN-13 Expansion	Expand[1]	
	Don't Expand	
UPC-E to EAN-13 Expansion	Expand[1]	
	Don't Expand	

END

1 When any expansion feature is enabled, the transmission of the Prefix, Suffix, Check Digit and Number System Digit (NSD) are controlled by your selections for the symbology 'expanded to' rather than the symbology 'expanded from'. For example, if you expand UPC-E to UPC-A, settings for UPC-A determine how the scanner sends a barcode's contents.

UPC/EAN Add-Ons

If you need to scan UPC or EAN labels that include Add-on codes, the selections on this page set the scanner's Add-on feature. There are three Add-on read modes available: optional, required and disabled.

Optional — the scanner will recognize UPC barcodes with or without Add-ons.

> **NOTE**
>
> *Due to the structure of Add-on codes, selecting the Optional setting makes it impossible to ensure that the scanner will always read the Add-on portion of the label. Spectra-Physics makes no guarantee, either written or implied, that scanners with optional Add-on decoding enabled will perform with the speed and accuracy required for any given application.*

Required — the scanner will not recognize or decode any UPC/EAN labels that do not contain an Add-on segment.

Disabled — the scanner will not recognize or decode any Add-on segment of UPC/EAN labels. The scanner will read and decode the standard UPC/EAN portion of the label.

Two Digit & Five Digit Add-Ons

SET ------------------------------------

Optional ---------------------

Required ---------------------

Disabled ---------------------

END ------------------------------------

UPC DATA FORMAT SETTINGS

These settings affect UPC data format when RS-232, OCIA or Keyboard Wedge is the active interface. Number System Digit (NSD) settings operate with RS-232 ONLY.

SET -----------------------------------

UPC-A

SEND CHECK DIGIT ------------

DON'T SEND CHECK DIGIT -----

SEND NSD[1] -----------------

DON'T SEND NSD[1] -----------

UPC-E

SEND CHECK DIGIT[2] -----------

DON'T SEND CHECK DIGIT[2]-----

SEND NSD[2] -----------------

DON'T SEND NSD[2] -----------

END -----------------------------------

1 NSD = Number System Digit. The NSD character is the character that precedes the UPC barcode. The NSD for regular UPC-A barcodes is a zero. Other commonly used Number System Digits used with UPC-A are:

- 2 - used for random weight items such as meat and produce
- 3 - used for the drug and health items
- 4 - used for in-store non-food items
- 5 - used for coupons

2 If UPC-E is expanded to UPC-A, the transmission of Check Digit (CD) and NSD will be determined by the UPC-A settings on this page, not by these settings.

EAN Data Format Settings

These settings affect EAN data format when RS-232 or OCIA is the active interface.

SET ------------------------------------

EAN-8

Send Check Digit ------------

Don't Send Check Digit -----

EAN-13

Send Check Digit ------------

Don't Send Check Digit -----

END ------------------------------------

PRICE/WEIGHT CHECK DIGIT

The price/weight check digit selections allow you to specify whether the scanner should calculate an extra check digit based on a four or five-digit price/weight block and compare it with the price/weight check digit contained in the barcode. If the calculated check digit does not match the value of the check digit contained in the barcode, the label will be rejected as invalid. Select domestic four or five digit, European four or five digit, or disable the price/weight check.

SYMBOLOGY SELECTION

PRICE/WEIGHT CHECK DIGIT

SET ------------------------------------

DISABLE PRICE/WEIGHT CHECK -

ENABLE 4 DIGIT CHECK --------

ENABLE 5 DIGIT CHECK --------

ENABLE EURO 4 DIGIT CHECK --

ENABLE EURO 5 DIGIT CHECK --

END ------------------------------------

Code 39 Options

The Code 39 symbology has the following programmable features:

Check Digit — calculate the Check Digit to verify that the Check Digit contained in the barcode label is correct. If you enable this feature, your barcodes <u>must</u> contain a Check Digit.

You may also choose to transmit or not transmit the Check Digit independent of whether the Check Digit is calculated by the scanner. If you choose to *Transmit Check Digit*, but not calculate, the scanner sends the Check Digit encoded in the barcode without verifying its accuracy. If you choose *Don't Transmit Check Digit*, the scanner will remove the Check Digit's contents before sending the barcode data to the host.

Start/Stop Characters — you can choose either Send or Don't Send depending on your host's interface requirement.

Code 39 Full ASCII — enable or disable Full ASCII Mode.

Code 39 Minimum Label Length — set the minimum label length required for Code 39 labels (not including the check character). This feature is provided to ignore small label segments, reducing the possibility that a portion of a good label is incorrectly seen as an entire label.

Code 39 (continued)

Use these labels to change the Code 39 programmable features.

SET ------------------------------------

Check Digit	Don't Compute	---------------
	Compute	----------------------
	Don't Transmit	--------------
	Transmit	---------------------
Start/Stop	Don't transmit	---------------
	Transmit	---------------------
Code 39 Full ASCII	Enable	------------------------
	Disable	-----------------------

END ------------------------------------

Code 39 (continued)

Follow these steps to set Code 39 Minimum Label Length:

1. Identify the minimum length setting you want to make. The selectable range is 00 to 48 characters.
2. Scan the SET label.
3. Scan the *Set Code 39 Minimum Label Length* barcode.

Setting Lengths

If you are setting a length less than ten, you must scan a zero first and then the length digit (04, 06, 08).

4. Set the minimum label length by scanning the correct digits from below and the next page.
5. Scan the END label.

SET ------------------------------------

Code 39 Minimum Label Length

Set Minimum Label Length ---

0 ----------------------------

1 ----------------------------

2 ----------------------------

3 ----------------------------

4 ----------------------------

Symbology Selection

Code 39 Minimum Label Length

5 ----------------------------

6 ----------------------------

7 ----------------------------

8 ----------------------------

9 ----------------------------

END ------------------------------------

INTERLEAVED 2 OF 5

The Interleaved 2 of 5 symbology has the following programmable features:

Check Digit — calculate the Check Digit to verify that the Check Digit contained in the barcode label is correct. If you enable this feature, your barcodes must contain a Check Digit.

You may also choose to transmit or not transmit the Check Digit independent of whether the Check Digit is calculated by the scanner. If you choose to *Transmit Check Digit*, but not calculate, the scanner sends the Check Digit encoded in the barcode without verifying its accuracy. If you choose *Don't Transmit Check Digit*, the scanner will remove the Check Digit's contents before sending the barcode data to the host.

Label Format — provides the selection between fixed or variable length labels. If your application has labels with specific fixed lengths, we recommend selecting fixed lengths to improve read rate and avoid short reads.

You can select any valid number of digits for reading specific length labels only. Read the following details for specific Interleaved 2 of 5 limits.

INTERLEAVED 2 OF 5 LABEL LENGTHS

Interleaved 2 of 5 Minimum Label Length — set the minimum label length required for I 2/5 labels (not including the check character). This feature is provided to ignore small label segments, reducing the possibility that a portion of a good label is incorrectly seen as an entire label.

Variable Length — If you select variable length, the scanner will recognize labels with an even number of digits between 04 and 50 digits.

Fixed Length — If you select fixed length, there are three labels for programming your scanner to read either one or two fixed lengths. The labels are:

- **Set First Fixed Length** — use this label to instruct the scanner that the next two programming labels you scan will define the first fixed label length. This setting can be any even number of digits between 04 and 50 digits.

- **Set Second Fixed Length** — use this label to instruct the scanner that the next two programming labels you scan will define the second fixed label length. Again, this setting can be any even number of digits between 04 and 50 digits.
- **No Second Fixed Length** — scan this label after setting the first fixed length to instruct the scanner to recognize only the label length chosen as the first fixed length.

I 2 of 5 Check Digit and Variable Length Label Selections

These programming labels determine whether you compute and send the check digit contents.

If you want to set the scanner to read only fixed length labels, follow the procedures on the pages immediately following.

SET

Check Digit

- Don't compute
- Compute
- Don't transmit
- Transmit

Variable Length Labels

- Enable
- Disable

END

Setting Interleaved 2 of 5 Fixed and Minimun Label Lengths

All interfaces that are shipped with the standard factory configuration are set to read variable length labels. If you switch from variable to fixed length labels, the default fixed label lengths are 14 digits and 8 digits. Follow the steps below to change these defaults. All fixed length settings for Interleaved 2 of 5 must be an even number.

Set Fixed

1. Identify the fixed length settings you want to make.
2. Scan the SET label.
3. Scan the *Enable First Fixed* barcode.

Setting Fixed Lengths

If you are setting a length less than ten, you must scan a zero first and then the length digit (04, 06, 08).

4. Set the first fixed label length by scanning the correct digits from the next two pages.

   If you need to set a second fixed length, continue with step five. If you do not need to set a second fixed length scan the *No 2nd Fixed Length* on this page and skip to step seven.
5. Scan the *Set Second Fixed* label.
6. Set the second fixed label length by scanning the correct digits from this page.
7. Scan the END label to complete the procedure.

Setting Minimum Label Length

1. Identify the minimum length setting you want to make. The selectable range is 00 to 48 characters.
2. Scan the SET label.
3. Scan the SET MINIMUM LABEL LENGTH barcode.

If you are setting a length less than ten, you must scan a zero first and then the length digit (04, 05, 09).

4. Set the minimum label length by scanning the correct digits from the next two pages.
5. Scan the END label.

INTERLEAVED 2 OF 5 FIXED AND MINIMUM LABEL LENGTHS

SET ------------------------------------

SET FIRST FIXED LENGTH ------

SET SECOND FIXED LENGTH ----

NO SECOND FIXED LENGTH -----

SET MINIMUM LABEL LENGTH ---

0 ----------------------------

1 ----------------------------

2 ----------------------------

3 ----------------------------

4 ----------------------------

5 ----------------------------

6 ----------------------------

7 ----------------------------

Setting Interleaved 2 of 5 Fixed and Minimum Label Lengths—Continued

8 ------------------------------

9 ------------------------------

END --------------------------------------

Standard 2 of 5

The Standard 2 of 5 symbology has the following programmable features:

Normal or IATA Selection — offers a choice between using "normal" format or IATA (International Airline Transport Association) format within the Standard 2 of 5 symbology. IATA is used for international tickets and boarding passes.

Check Digit — calculate the Check Digit to verify that the Check Digit contained in the barcode label is correct. If you enable this feature, your barcodes must contain a Check Digit.

NOTE

If you are using the IATA format, ONLY labels with 15 characters will actually have their Check Digit calculated per IATA standards (recommended Practice 1720a, attachment D, current 6/95). Labels with lengths other than 15 characters will be passed without any check digit calculation.

You may also choose to transmit or not transmit the Check Digit independent of whether the Check Digit is calculated by the scanner. If you choose to *Transmit Check Digit*, but not calculate, the scanner sends the Check Digit encoded in the barcode without verifying its accuracy. If you choose *Don't Transmit Check Digit*, the scanner will remove the Check Digit's contents before sending the barcode data to the host.

Label Format — provides the selection between fixed or variable length labels. If your application has labels with specific fixed lengths, we recommend selecting fixed lengths to improve read rate and avoid short reads.

You can select any valid number of digits for reading specific length labels only. Read the following details for specific Standard 2 of 5 limits.

Standard 2 of 5 Label Lengths

Standard 2 of 5 Minimum Label Length — set the minimum label length required for I 2/5 labels (not including the check character). This feature is provided to ignore small label segments, reducing the possibility that a portion of a good label is incorrectly seen as an entire label.

Variable Length — If you select variable length, the scanner will recognize labels with an even number of digits between 01 and 50 digits.

Fixed Length — If you select fixed length, there are three labels for programming your scanner to read either one or two fixed lengths. The labels are:

- **Set First Fixed Length** — use this label to instruct the scanner that the next two programming labels you scan will define the first fixed label length. This setting can be any number of digits between 01 and 50 digits.
- **Set Second Fixed Length** — use this label to instruct the scanner that the next two programming labels you scan will define the second fixed label length. Again, this setting can be any number of digits between 01 and 50 digits.
- **No Second Fixed Length** — scan this label after setting the first fixed length to instruct the scanner to recognize only the label length chosen as the first fixed length.

Normal or IATA Selection

Use these labels to select either normal, or IATA (International Airline Transport Association) format.

SET ------------------------------------

Normal Standard 2 of 5 ----

IATA Standard 2 of 5 ------

END ------------------------------------

Std 2 of 5 Check Digit and Variable Length Label Selections

These programming labels determine whether you compute and send the check digit contents.

If you want to set the scanner to read only fixed length labels, follow the procedures on the pages immediately following.

SET

Symbology Selection

Check Digit

- Don't compute
- Compute
- Don't transmit
- Transmit

Variable Length Labels

- Enable
- Disable

END

Setting Standard 2 of 5 Fixed and Minimun Label Lengths

All interfaces that are shipped with the standard factory configuration are set to read variable length labels. If you switch from variable to fixed length labels, the default fixed label lengths are 14 digits and 8 digits. Follow the steps below to change these defaults.

SET FIXED

1. Identify the fixed length settings you want to make.
2. Scan the SET label.
3. Scan the *Enable First Fixed* barcode.

SETTING FIXED LENGTHS

If you are setting a length less than ten, you must scan a zero first and then the length digit (01, 08, 09).

4. Set the first fixed label length by scanning the correct digits from the next two pages. (Selectable range is 01 to 50 digits.)

   If you need to set a second fixed length (selectable range is 00 to 50 digits.), continue with step five. If you do not need to set a second fixed length scan the *No 2nd Fixed Length* on this page and skip to step seven.
5. Scan the *Set Second Fixed* label.
6. Set the second fixed label length by scanning the correct digits from this page.
7. Scan the END label to complete the procedure.

SETTING MINIMUM LABEL LENGTH

1. Identify the minimum length setting you want to make. The selectable range is 01 to 50 characters.
2. Scan the SET label.
3. Scan the SET MINIMUM LABEL LENGTH barcode.

If you are setting a length less than ten, you must scan a zero first and then the length digit (04, 05, 09).

4. Set the minimum label length by scanning the correct digits from the next two pages.
5. Scan the END label.

SET ------------------------------------

SET FIRST FIXED LENGTH ------

SYMBOLOGY SELECTION

Standard 2 of 5 Fixed and Minimum Label Lengths

Set Second Fixed Length ----

No Second Fixed Length -----

Set Minimum Label Length ---

0 -----------------------------

1 -----------------------------

2 -----------------------------

3 -----------------------------

4 -----------------------------

5 -----------------------------

6 -----------------------------

7 -----------------------------

8 -----------------------------

9 -----------------------------

END ------------------------------------

Codabar Options

The Codabar symbology has the following programmable features:

Check Digit — calculate the Check Digit to verify the labels contents have been read correctly. If you enable this feature, your barcodes must include a Check Digit. You may also choose to transmit or not transmit the Check Digit.

Start/Stop Characters — you can choose either Send or Don't Send depending on your host's interface requirement.

Start/Stop Format — if you need to send the Start/Stop characters, there are four standard format options that you can select from; ABCD/TN*E, ABCD/ABCD, abcd/tn*e, or abcd/abcd. This setting must match your system requirements. If you select one of these options, it determines how the ASCII characters A, B, C, D that are used for Start/Stop characters, will be translated before being sent to the host.

Start/Stop Match — the requirement that the Start and Stop characters must match (be identical) can be enabled or disabled.

Label Format — provides the selection between fixed or variable length labels. If your application has labels with specific fixed length, we recommend selecting fixed lengths to improve read rate.

If you select variable length, the scanner will recognize labels with between 2 and 47 digits (not including the optional check digit).

Set First Fixed Length — if you select fixed length, use this feature to set a first fixed label length to a setting between 2 and 47 digits.

Set Second Fixed Length — if you select fixed length, use this feature to set a second fixed label length to a setting between 2 and 47 digits.

No Second Fixed Length — scan this label after setting the first fixed length to instruct the scanner to recognize only the label length chosen as the first label length.

Gap Check — allows the scanner to combine two label halves printed in close proximity to each other that may have been printed at different times and perhaps different locations.

Codabar Check Digit & Variable Length

These programming labels determine whether you compute and send the check digit contents and enables variable length.

If you want to set the scanner to read only fixed length labels, follow the procedures on the following pages.

SET

Check Digit	Don't compute
	Compute
	Don't transmit
	Transmit
Variable Length Labels	Enable
	Disable
Gap Check	Enable
	Disable

END

Symbology Selection

Codabar Start/Stop Character

These barcodes allow you to set the Start/Stop character format and transmission. Refer to your host user's manual to identify your system requirements, then use these labels to select which characters are transmitted.

Start/Stop Format & Transmission Specifications

SET

Match not Required

Match Required

Don't Transmit

Transmit[1]

Format = ABCD/TN*E

Format = abcd/tn*e

Format = ABCD/ABCD

Format = abcd/abcd

END

1 Choosing Transmit *Start/Stop* characters requires selecting one of these four data format selections: ABCD/TN*E, abcd, tn*e, ABCD/ABCD, or abcd/abcd. Refer to Appendix A, *Standard Factory Settings*, to identify the default setting for your scanner's interface type.

Codabar Fixed Length

All interfaces that are shipped with the standard factory settings are set to read variable length labels for Codabar. If you switch from variable to fixed length labels, the factory set fixed label lengths are 14 and 8. Follow the steps below to change these defaults.

Enable Fixed

1. Identify the fixed length settings you want to make.
2. Scan the SET label.
3. Scan the *Set First Fixed Length* label.

Setting Lengths

If you are setting a length less than ten, you must scan a zero first and then the length digit (02, ...09).

4. Set the first fixed length label by scanning the correct digits from the next page.

   If you need to set a second fixed length, continue with step five. If you do not need to set a second fixed length scan the *No 2nd Fixed Length* label below and skip to step seven.

SET ------------------------------------

Codabar

Set First Fixed Length ------

Set Second Fixed Length ----

No Second Fixed Length -----

5. Scan the *Set Second Fixed Length* label.
6. Set the second fixed label length by scanning the correct digits from this page.
7. Scan the END label to complete the procedure.

0 ----------------------------

1 ----------------------------

2 ----------------------------

3 ----------------------------

4 ----------------------------

5 ----------------------------

6 ----------------------------

7 ----------------------------

8 ----------------------------

9 ----------------------------

END ------------------------------------

MSI/Plessey Check Digit

MSI/Plessey Check Digit options include:

Check Digit Calculation — calculate the Check Digit to verify the labels contents have been read correctly. If you enable this feature, your barcodes must include a Check Digit. You may also choose to transmit or not transmit the Check Digit.

Transmit Check Digit — enable or disable transmission of MSI/Plessey Check Digit(s).

Number of Check Digits — specify either one or two Check Digits.

Symbology Selection

SET ------------------------------------

MSI/Plessey Check Digit Selections

Calculate Check Digit -------

Don't Calculate Check Digit

Transmit Check Digit --------

Don't Transmit Check Digit -

One Check Digit ------------

Two Check Digits ------------

END ------------------------------------

MSI/Plessey Fixed Length

With the ***SP400RF*** scanner, you now have the option of requiring MSI/Plessey labels to have one or two fixed length(s).

To set fixed length(s) for MSI/Plessey labels:

1. Identify the fixed length setting(s) you wish to make. Fixed lengths can be set from four to fifteen, including check character(s).
2. Scan the SET label.
3. Scan the ENABLE MSI/PLESSEY FIXED label.
4. Scan the SET FIRST FIXED LENGTH label.
5. Set the first fixed label length by scanning the correct digits on the following page. If you are setting a length less than ten, you must scan a zero first and then the length digit (e.g., 04, 06, 09). If a second fixed length is not needed, skip to Step 8.
6. If a second fixed length is desired, scan the SET SECOND FIXED LENGTH label.
7. Set the second fixed label length by scanning the correct digits on the following page. Remember, if you're setting a length less than ten, you must scan a zero first and then the length digit.
8. Scan the END label.

Symbology Selection

MSI/Plessey Enable Fixed Lengths

SET ------------------------------------

Enable MSI/Plessey Fixed ---

Disable MSI/Plessey Fixed --

MSI/Plessey Set Fixed Lengths

Set First Fixed Length ------

Set Second Fixed Length ----

No Second Fixed Length -----

0 ------------------------------

1 ------------------------------

2 ------------------------------

3 ------------------------------

4 ------------------------------

5 ------------------------------

6 ------------------------------

7 ------------------------------

8 ------------------------------

9 ------------------------------

END --------------------------------------

CODE 128 OPTIONS

AIM SYMBOLOGY ID PREFIX

The Automatic Identification Manufacturers, Inc. of the United States (AIM USA) have standardized the reporting of data sources from barcode reading devices. Sending the AIM symbology prefix identifies the symbology to the host terminal, allowing it to specifically differentiate between UCC-128 (Code 128 with Function Character 1 in the first position) and standard Code 128 symbols. When this feature is disabled, the host cannot differentiate between these symbols.

Scan the labels below to enable or disable the sending of an AIM symbology ID prefix.

AIM SYMBOLOGY ID PREFIX

SET ------------------------------------

ENABLE ------------------------

DISABLE ------------------------

END ------------------------------------

General Features

The following section contains the features that are generally common to all interfaces. These features provide a flexible, user configurable interface that accommodates user preferences.

Communications Protocol

The ***SP400RF*** allows configuration of several different commands that can be sent and received by the scanner, Base Station and host terminal. Programming labels to set these options and their descriptions can be found on the following pages. Configurable commands are:

ACK — Acknowledge. The host message was received and processed correctly, and no data was requested from the scanner or Base Station. (0x06)

CTS — Clear to Send. This is a command sent by an RS-232 host. When CTS is enabled, the scanner must wait for an active CTS command from the host before transmitting data. Valid only for RS-232 interfaces.

ETX — End Transmission. Label transmissions can be "framed" by optional STX (Start Transmission) and ETX characters, which are selectable by the user. (Factory default is 000—disabled.)

Item On File — The host, upon receiving a label transmission from the scanner and comparing the information with its database, found a match. (0x7E)

Item Not On File — After receiving a label transmission from the scanner, the host cannot find a match for the label in its database. (0x7F)

NAK — No Acknowledge. The host message wasn't received correctly (checksum or parity error, overrun, etc.).

STX — Start Transmission. Label transmissions can be "framed" by optional STX and ETX (End Transmission) characters, which are selectable by the user. (Factory default is 000—disabled.)

WACK — Wait for Acknowledge. This is a radio feature. When enabled, it precedes the ACK signal[1].

1 In some systems, the ACK response is sent so quickly from the interface that it can override the WACK signal. In this case, the WACK is never perceived by the scanner.

ACK/NAK for Labels — When enabled, allows ACK/NAK commands to be sent to the host terminal.

ACK/NAK for Commands— When enabled, allows ACK/NAK commands to be sent from the host terminal.

Item ON/NOT ON File — When enabled, the host sends either an "Item On File", or "Item Not On File" upon receipt of label data from the scanner.

SET

ACK/NAK FOR LABELS

ENABLE

DISABLE

ACK/NAK FOR COMMANDS

ENABLE

DISABLE

ITEM ON/ NOT ON FILE

ENABLE

DISABLE

END

STX/ETX

Label transmissions can be optionally "framed" by STX (Start Transmission) and ETX (End Transmission) commands. The BCD value representing any ASCII character shown in the table on the following page is selectable, except for the following reserved ASCII characters: ack, nak, B, D, E, R, ~ and del.

To set STX, follow these steps:

1. Determine your requirement for STX character(s), then consult the ASCII chart shown on the next page to identify the corresponding BCD value for the desired ASCII character(s).
2. Scan the SET label.
3. Scan the SET STX label on this page.
4. Scan the digits on the following pages that correspond to the required BCD value you determined from step one. A "forced entry" of three digits is required to set the value, so it will be necessary to preface the digits with a leading zero as shown in the ASCII table.

> **NOTE**
>
> *If you make a mistake, or lose your place while setting this option, scan the "end" label to exit Programming Mode. The scanner will sound a rejection tone (a "good beep" followed by a low "bad beep") to indicate that programming was incomplete, and the setting will remain as it was before entering Programming Mode.*

5. Scan END.

To set ETX, follow steps one through five above, substituting ETX for STX at all steps.

ASCII CHARACTER SET

The table on this page shows a set of ASCII characters and their corresponding BCD and Hex values. The BCD values in this table are needed for setting STX and ETX commands.

ASCII CHAR.	HEX VALUE	BCD VALUE	ASCII CHAR.	HEX VALUE	BCD VALUE	ASCII CHAR.	HEX VALUE	BCD VALUE	ASCII CHAR.	HEX VALUE	BCD VALUE
nul	00	000	sp	20	032	@	40	064	`	60	096
soh	01	001	!	21	033	A	41	065	a	61	097
stx	02	002	"	22	034	B	42	066	b	62	098
etx	03	003	#	23	035	C	43	067	c	63	099
eot	04	004	$	24	036	D	44	068	d	64	100
enq	05	005	%	25	037	E	45	069	e	65	101
ack	06	006	&	26	038	F	46	070	f	66	102
bel	07	007	'	27	039	G	47	071	g	67	103
bs	08	008	(	28	040	H	48	072	h	68	104
ht	09	009	)	29	041	I	49	073	i	69	105
lf	0A	010	*	2A	042	J	4A	074	j	6A	106
vt	0B	011	+	2B	043	K	4B	075	k	6B	107
ff	0C	012	'	2C	044	L	4C	076	l	6C	108
cr	0D	013	-	2D	045	M	4D	077	m	6D	109
so	0E	014	.	2E	046	N	4E	078	n	6E	110
si	0F	015	/	2F	047	O	4F	079	o	6F	111
dle	10	016	0	30	048	P	50	080	p	70	112
dc1	11	017	1	31	049	Q	51	081	q	71	113
dc2	12	018	2	32	050	R	52	082	r	72	114
dc3	13	019	3	33	051	S	53	083	s	73	115
dc4	14	020	4	34	052	T	54	084	t	74	116
nak	15	021	5	35	053	U	55	085	u	75	117
syn	16	022	6	36	054	V	56	086	v	76	118
etb	17	023	7	37	055	W	57	087	w	77	119
can	18	024	8	38	056	X	58	088	x	78	120
em	19	025	9	39	057	Y	59	089	y	79	121
sub	1A	026	:	3A	058	Z	5A	090	z	7A	122
esc	1B	027	;	3B	059	[	5B	091	{	7B	123
fs	1C	028	<	3C	060	\	5C	092	|	7C	124
gs	1D	029	=	3D	061	]	5D	093	}	7D	125
rs	1E	030	>	3E	062	^	5E	094	~	7E	126
us	1F	031	?	3F	063	_	5F	095	del	7F	127

SET

SET STX/ETX

SET STX

SET ETX

0

1

2

3

4

5

6

7

8

9

END

GENERAL FEATURES

When To Acknowledge

The SP400RF allows you to select the point at which the Base Station will acknowledge messages from the scanner. An "Acknowledge" is a response from the Base Station to the scanner with an ACK, WACK, NAK, or no response (see *Communications Protocol* at the start of this section for a definition of these terms). "When to Acknowledge" has three options:

Option ① - The Base Station acknowledges the receipt of a message from the scanner after the message is checked.
Option ② - The Base Station acknowledges receipt of a message from the scanner after the Base Station sends the last byte to the host
Option ③ - The Base Station acknowledges receipt of a message from the scanner after CTS (RS-232 only) is enabled from the host.

Radio and Interface Layers (Software)

For the radio layer to validate a message, the transmission from the scanner to the Base Station is checked. (For example, CRC calculation, header format, correct number of bytes, etc.) For the interface layer to validate a message, the message from the radio layer is checked to ensure it is a valid label for a selected interface option.

Scanner Audible Responses

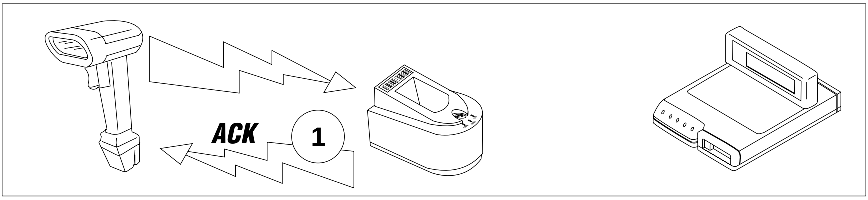
Once the scanner reads a barcode, it will produce a "Good Read" beep immediately. If the scanner does not receive a response from the Base Station within a programmed period of time after the label is read, the scanner will emit a "Bad Transmission" indication[1] for the second beep. If the Base Station determines that the message is not a valid label for the interface, or the Base Station has been told via host commands or host handshaking to disable scanning, Base Station will send a NAK to the scanner. The scanner will then sound a "NAK from the Base" indication[1] for the second beep. When any of the "When to Acknowledge" options are enabled, the Base Station will send an ACK to the scanner, causing it to sound an "ACK from the Base" indication[1].

1 Scanner beep indications are defined later in this section under the *"When to Beep" Options* heading.

Option 1 — Send ACK to the scanner once Base Station receives a message.

WACK Mode Disabled—ACK will be sent immediately, once the radio layer of software detects a valid transmission from the scanner. With WACK Mode disabled, ACK is sent to the scanner regardless of what the interface layer (software) has done or is doing.

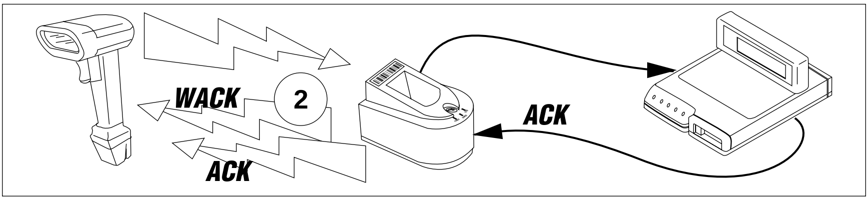
WACK Mode Enabled[2]**—**WACK is sent[3] once the radio layer (software) validates the message, then ACK is sent to the scanner once the interface layer (software) validates the transmission from the scanner and has received an ACK from the host (if the interface supports handshaking).



Option 2 — Send ACK to the scanner after message is transmitted to the host.

WACK Mode Disabled—ACK will be sent immediately, once the radio layer of software detects a valid transmission from the scanner. With WACK Mode disabled, ACK is sent to the scanner regardless of what the interface layer (software) has done or is doing.

WACK Mode Enabled[2]**—**WACK is sent[3] once the radio layer (software) validates the message, then ACK is sent to the scanner once the interface layer (software) validates the transmission from the scanner, has sent the full message to the host, and has received an ACK from the host (if the interface supports handshaking).



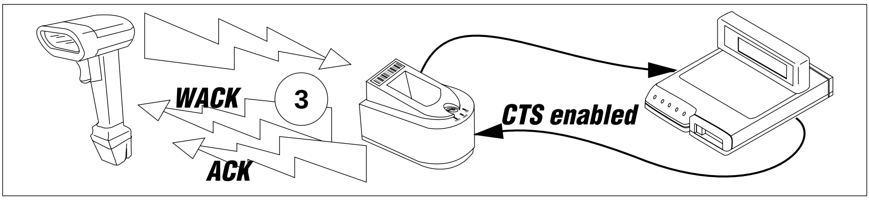
2 When WACK mode is enabled, wait time for host acknowledgement is a critical setting. Reference the feature in this section titled "*Wait Time for Host Acknowledge*".

3 In some systems, the ACK response is sent so quickly from the interface that it can override the WACK signal. In this case, the WACK is never perceived by the scanner.

Option 3 — Send ACK to the scanner after CTS is enabled from the host. RS-232 feature ONLY.

WACK Mode Disabled—ACK will be sent immediately, once the radio layer of software detects a valid transmission from the scanner. With WACK Mode disabled, ACK is sent to the scanner regardless of what the interface layer (software) has done or is doing.

WACK Mode Enabled[2]**—**WACK is sent[3] once the radio layer (software) validates the message, then ACK is sent to the scanner once the interface layer (software) validates the transmission from the scanner, has sensed the CTS being enabled and has received an ACK from the host (if the interface supports handshaking).



General Features

WACK Mode Recommendation

It is recommended that WACK Mode be enabled to ensure the best, most accurate performance. Scanner response will seem quicker when WACK Mode is disabled, however, there is a greater chance that the scanner will erroneously respond with a"Good Read" beep when the host has not received the message, or is not ready for a message. As described in the options above, this is because the interface layer status is not checked to ensure its readiness to receive a message from the radio.

2 When WACK mode is enabled, wait time for host acknowledgement is a critical setting. Reference the feature in this section titled "*Wait Time for Host Acknowledge*".

3 In some systems, the ACK response is sent so quickly from the interface that it can override the WACK signal. In this case, the WACK is never perceived by the scanner.

SET ------------------------------------

When to Acnowledge

Option ① --------------------

Option ② --------------------

Option ③ --------------------

Enable/Disable WACK

Enable WACK[1] from Base Station -

Disable WACK from Base Station -

END ------------------------------------

1 When WACK mode is enabled, wait time for host acknowledgement is a critical setting. Reference the feature in this section titled "*Wait Time for Host Acknowledge*".

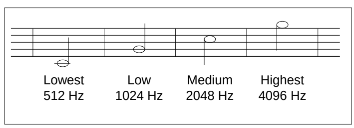
"When to Beep" Options

The ***SP400RF*** provides many options for programming the scanner's audible beep. The beeper may be programmed to be silent[1], or may be required to announce one or multiple communication events as they occur between the scanner, Base Station and host terminal.

> **NOTE**
>
> *Before programming this option, ensure that your selection is compatable with your scanner's setting for "When to Acknowledge" on the previous two pages.*

Table 1 describes the tone(s), duration and number of repetitions for all SP400RF beep signals and indicates user programmability of the feature.

Tone — is the frequency of the beep measured in Hertz, with the lowest tone sounded at 512 Hz and the highest at 4096 Hz.



Duration — is the time period for which the beep is sounded measured in milliseconds; 100ms, 250ms, and 500ms increments are used.

Number of repetitions — is the number of times that the beep is sounded for that indication.

User Programmable? — indicates whether the beep indication can be turned OFF/ON using programming labels.

Table 1

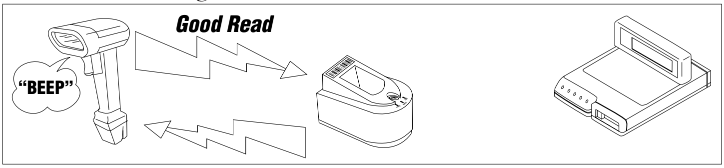
Indication	Tone (Hz)	Duration(ms)	# Reps	User Progr?
Good Read	1024	100	1	YES
Sent to the Base	2048	100	1	YES
ACK from the Base	4096	100	1	YES
WACK from the Base	4096	100	1	YES
NAK from the Base	512	100	10	YES
Config Upload	4096	100	1	NO
Bad Transmission	512	500	1	NO
SYNC[2]	4096	250	1	NO
Bad SYNC[2]	512	500	1	NO
Power fail	2048-1024-512	100	3	NO

1 Only the beep indications identified in Table 4-1 as user programmable can be silenced. The remaining beep indicators are always enabled by default.

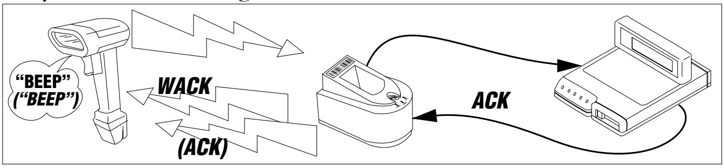
2 SYNC occurs when Base Station ID or radio channel selection labels are scanned.

The beeper may be programmed to announce one, or any combination of these communication events. (See the preceding section *"When to Acknowledge"* for definitions of the various signals.):

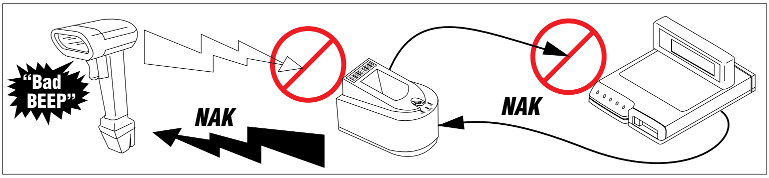
- Good Read — the scanner has successfully read a barcode and sent the message to the Base Station



- WACK / ACK — the Base Station confirms reception and sends a "Wait to Acknowledge" (WACK) signal to the scanner, followed by an "Acknowledge" (ACK) command[3].



- NAK — data sent to the host was faulty or not received; the Base Station sends a "No Acknowledge" (NAK) command to the scanner.



3 In some systems, the ACK response is sent so quickly from the interface that it can override the WACK signal. In this case, the expected beep on WACK is not sounded.

GENERAL FEATURES

Table 2 describes the sixteen different options that allow full control over "when to beep" settings. Use the programming barcodes on the following two pages to select an option:

Option	Good Read	WACK	ACK	NAK
0	NO	NO	NO	NO
1	NO	NO	NO	YES
2	NO	NO	YES	NO
3	NO	NO	YES	YES
4	NO	YES[1]	NO	NO
5	NO	YES[1]	NO	YES
6	NO	YES[1]	YES	NO
7	NO	YES[1]	YES	YES
8	YES	NO	NO	NO
9	YES	NO	NO	YES
10	YES	NO	YES	NO
11[2]	YES	NO	YES	YES
12	YES	YES[1]	NO	NO
13	YES	YES[1]	NO	YES
14	YES	YES[1]	YES	NO
15	YES	YES[1]	YES	YES

Table 2

1 In some systems, the ACK response is sent so quickly from the interface that it can override the WACK signal. In this case, the expected beep on WACK is not sounded.

2 The factory default and optimum setting for this option is number 11.

"When to Beep" Options—Continued

Use the programming barcodes on this and the following page to select a "when to beep" option from Table 1.

SET ----------------------------------

"When to Beep" Options

Option 0 --------------------

Option 1 --------------------

Option 2 --------------------

Option 3 --------------------

Option 4 --------------------

Option 5 --------------------

Option 6 --------------------

Option 7 --------------------

Option 8 --------------------

Option 9 --------------------

Option 10 ------------------

General Features

"When to Beep" Options—Continued

Use the programming barcodes on this and the previous page to select a "when to beep" option from Table 1.

"When to Beep" Options

Option 11 ------------------

Option 12 ------------------

Option 13 ------------------

Option 14 ------------------

Option 15 ------------------

END ------------------------------------

Beeper Volume

Use the labels below to adjust the beeper volume to normal or loud.

SET ------------------------------------

Beeper Volume

Normal ----------------------

Loud ------------------------

END ------------------------------------

Radio Channel Frequency

Nine channels[1] are available on the ***SP400RF*** to ensure good reception and offer minimal interference with other local equipment. You may wish to experiment with different channel settings to optimize your reception. The factory default channel setting is channel five.

It is not necessary to scan SET or END labels in association with these radio channel programming labels.

Radio Channel Frequency

Channel 1 --------------------

Channel 2 --------------------

Channel 3 --------------------

Channel 4 --------------------

Channel 5 --------------------

Channel 6 --------------------

Channel 7 --------------------

Channel 8 --------------------

Channel 9 --------------------

General Features

1 In Spain, only one channel is available. These labels have no effect on models shipped to Spain.

Radio Transmit Power

Adjustment of radio transmission power may be necessary for two reasons:

1. Reception is poor, or radio interference is heavy in the vicinity (try adjusting power to HIGH to compensate[2]).
2. Use of the ***SP400RF*** is causing interference with other equipment (set radio transmit power to LOW[2]).

SET ------------------------------------

Rado Transmit Power

Set Transmit Power LOW --

Set Transmit Power HIGH --

END ------------------------------------

General Features

2 Another possible remedy for radio interference would be to configure the ***SP400RF*** with a different channel. See *Radio Channel Frequency*.

Wait Time For Host Acknowledge

The wait time for the Base Station to receive an acknowledge command from the host is adjustable in twenty millisecond ticks, with a selectable range from 000 to 255 (0 to 5.1 seconds). The factory default setting for this feature is 200ms.

> **WARNING**
>
> *Wait time for host acknowledge is especially critical when WACK mode is enabled, and should be calculated using the formula below.*

$$\textbf{Wait Time} > \textbf{number of barcode characters} \times \left(\frac{\textbf{number of bits per byte}}{\textbf{baud rate + intercharacter}} \right)$$

To set the host acknowledge wait time:

1. Determine the desired wait time in twenty millisecond ticks (for example: sixty).
2. Scan the SET label.
3. Scan the SET WAIT TIME FOR HOST ACKNOWLEDGE label.
4. Set the wait time by scanning the desired amount (note that three digits are required). In the case of our example; 60 milliseconds would be selected by scanning 0-0-3 (20ms tick x 3 = 60ms).
5. Scan the END label.

SET ------------------------------------

Set Wait Time for Host ACK ----

Wait Time for Host Acknowledge

0 ----------------------------

1 ----------------------------

2 ----------------------------

General Features

WAIT TIME FOR HOST ACKNOWLEDGE

3

4

5

6

7

8

9

END

Read Verification

SP400RF programming has been improved to allow selection of read verification "minimum read" requirements by symbology type, rather than universally. This means that the scanner needn't waste valuable time verifying high-confidence symbologies, while offering the security of multiple read verification on less reliable codes.

NOTE

The more times the scanner is required to read and compare the barcode data, the longer it will take to complete a good read cycle.

To set the minimum read requirement for a desired symbology:

1. Scan the SET label.
2. Scan one symbology label below to select the symbology to be verified.
3. Scan the label on the following page representing the amount of times you wish a barcode label of that symbology type to be read before transmission to the host
4. Repeat steps one through three above until read verification has been selected for all symbologies you desire to be verified.
5. Scan the END label.

SET ------------------------------------

Read Verification Symbology Type

Verify UPC-A ---------------

Verify UPC-E ---------------

Verify EAN-8 ---------------

Verify EAN-13 --------------

Verify Instore Label ---------

GENERAL FEATURES

READ VERIFICATION SYMBOLOGY TYPE

VERIFY CODE 39 --------------

VERIFY INTERLEAVED 2 OF 5 ----

VERIFY STANDARD 2 OF 5 ------

VERIFY CODABAR ---------------

VERIFY CODE 93 --------------

VERIFY CODE 128 ------------

VERIFY MSI/PLESSEY ---------

VERIFY READS

ONE READ -------------------

TWO READS ------------------

THREE READS ----------------

FOUR READS -----------------

END ------------------------------------

Low Battery Indication Method

A choice of two methods are available to indicate a low battery condition. You may choose to have no audible indication (no beep), or a double beep each time the trigger is pulled. Both methods disallow scanning to occur until the battery is succesfully replaced.

> **WARNING**
>
> *If the "NO BEEP" option is seclected, unpredictable results will occur if the battery power goes too low.*

Low Battery Indication

SET

Beep Twice

No Beep

END

APPENDIX A
STANDARD FACTORY SETTINGS

FACTORY DEFAULTS

Text formatted in **BOLD** type indicates the standard factory configuration setting. These settings are valid if these settings have not been changed in a previous programming session.

SYMBOLOGY SELECTION

UPC/EAN

Symbology	**ENABLE**	Disable	
Expand UPC-A to EAN-13	Enable	**DISABLE**	
Expand UPC-E to UPC-A	Enable	**DISABLE**	
Expand EAN-8 to EAN-13	Enable	**DISABLE**	
Expand UPC-E to EAN-13	Enable	**DISABLE**	
Add-Ons	Required	Optional	**DISABLE**
Price/Weight Check	**DISABLE**	4-Digit	5-Digit
	Euro 4-Digit	Euro 5-Digit	

CODE 39

Symbology	Enable	**DISABLE**
Check Digit	Calculate	**DON'T CALCULATE**
Check Digit	**SEND**	Don't Send
Start/Stop Character	Send	**DON'T SEND**
Read One Character Label	Enable	**DISABLE**
Code 39 Minimum Label Length	**1**	
Code 39 Full ASCII	Enable	**DISABLE**

INTERLEAVED 2 OF 5

Symbology	**ENABLE**	Disable
Check Digit	Calculate	**DON'T CALCULATE**
Check Digit	**SEND**	Don't Send
Label Format	Fixed	**VARIABLE LENGTH**
Set 1st Fixed Length	**14**	
Set 2nd Fixed Length	**8**	
Minimum Length	**2**	

Standard 2 of 5

Symbology	**ENABLE**	Disable	
Check Digit	Calculate	**DON'T CALCULATE**	
Check Digit	**SEND**	Don't Send	
Label Format	Fixed	**VARIABLE LENGTH**	
Set 1st Fixed Length	**14**		
Set 2nd Fixed Length	**8**		
Minimum Length	**1**		

Codabar

Symbology	Enable	**DISABLE**	
Check Digit	Calculate	**DON'T CALCULATE**	
Check Digit	**SEND**	Don't Send	
Start/Stop Character	**SEND**	Don't Send	
Start/Stop Format	ABCD/TN*E	**ABCD/ABCD**	
	abcd/tn*e	abcd/abcd	
Start/Stop Match	Enable	**DISABLE**	
Label Format	Fixed	**VARIABLE LENGTH**	
Set 1st Fixed Length	**14**		
Set 2nd Fixed Length	**8**		
Gap Check	Enable	**DISABLE**	

Code 93

Symbology	Enable	**DISABLE**	

Code 128

Symbology	Enable	**DISABLE**	

MSI/Plessey

Symbology	Enable	**DISABLE**	
Calculate Check Digit	Calculate	**DON'T CALCULATE**	
Transmit Check Digit	**SEND**	Don't Send	
Number of Check Digits	1	2	**DISABLE**
Label Format	Fixed	**VARIABLE LENGTH**	
Set 1st Fixed Length	**14**		
Set 2nd Fixed Length	**8**		

General Features

ACK/NAK Protocol

ACK/NAK for Labels	Enable	**DISABLE**
ACK/NAK for Commands	Enable	**DISABLE**

Item ON/OFF File

Item ON/OFF File	Enable	**DISABLE**

ETX/STX

ETX	**DON'T SEND**	Send
STX	**DON'T SEND**	Send

Audible Indicator Settings

Volume	Low	**HIGH**
When to Beep (options 1-15)	**OPTION 11**	

Misc. General Features

Radio Channel Frequency	**CHANNEL 5**	
Radio Transmit Power	**LOW**	High
Configuration Upload	YES	**NO**
Wait Time for Host Acknowledge	**200ms**	
Low Battery Indication	**YES**	No

Read Verification

UPC-A	**1 READ**	2 read	3 read	4 read
UPC-E	1 read	**2 READ**	3 read	4 read
EAN-8	**1 READ**	2 read	3 read	4 read
EAN-13	**1 READ**	2 read	3 read	4 read
Instore Label	**1 READ**	2 read	3 read	4 read
Code 39	**1 READ**	2 read	3 read	4 read
Interleaved 2 of 5	**1 READ**	2 read	3 read	4 read
Standard 2 of 5	**1 READ**	2 read	3 read	4 read
Codabar	**1 READ**	2 read	3 read	4 read
Code 93	**1 READ**	2 read	3 read	4 read
Code 128	**1 READ**	2 read	3 read	4 read
MSI/Plessey	**1 READ**	2 read	3 read	4 read

Interface-Discrete Defaults

The following factory defaults apply only to the interface listed.

RS-232/Keyboard Wedge

Communication Parameters

Baud Rate				
----------------------------	1200	2400	4800	
	9600	19200	38400	
Parity				
----------------------------	**NONE**	Even	Odd	
	Mark	Space		
Stop Bits				
----------------------------	**ONE**	Two		
Data Bits				
----------------------------	Seven	**EIGHT**	Nine	
Hardware Handshaking (CTS/RTS)				
Hardware Control -------	Enable	**DISABLE**		
CTS/RTS Flow Control -	Enable	**DISABLE**		
CTS Scan Control -------	Enable	**DISABLE**		
Software Handshaking (Xon/Xoff)				
----------------------------	Enable	**DISABLE**		
Intercharacter Delay				
----------------------------	**NONE**	10ms	20ms	30ms
	40ms	50ms	60ms	70ms
	80ms	90ms	100ms	
Label ID Transmission				
Label ID X-mission -----	**DISABLE**	X-mit as Prefix	X-mit as Suffix	

RS-232/Keyboard Wedge Default Symbology Identifiers

UPC-A	Don't Send	**SEND AS 'A'**
UPC-E	Don't Send	**SEND AS 'E'**
EAN-8	Don't Send	**SEND AS 'FF'**
EAN-13	Don't Send	**SEND AS 'F'**
UPC-A (2 add-on)	Don't Send	**SEND AS 'A'**
UPC-A (5 Add-on)	Don't Send	**SEND AS 'A'**
UPC-A (8 Add-on)	Don't Send	**SEND AS 'A'**
UPC-E (2 add-on)	Don't Send	**SEND AS 'E'**
UPC-E (5 Add-on)	Don't Send	**SEND AS 'E'**
UPC-E (8 Add-on)	Don't Send	**SEND AS 'E'**
EAN-8 (2 add-on)	Don't Send	**SEND AS 'FF'**
EAN-8 (5 Add-on)	Don't Send	**SEND AS 'FF'**
EAN-8 (8 Add-on)	Don't Send	**SEND AS 'FF'**
EAN-13 (2 add-on)	Don't Send	**SEND AS 'F'**
EAN-13 (5 Add-on)	Don't Send	**SEND AS 'F'**
EAN-13 (8 Add-on)	Don't Send	**SEND AS 'F'**
Code 39	Don't Send	**SEND AS '*'**
Codabar	Don't Send	**SEND AS '%'**
Ind.2 of 5	Don't Send	**SEND AS 'i'**
Standard 2 of 5	Don't Send	**SEND AS 's'**
Code 93	Don't Send	**SEND AS '&'**
Code 128	Don't Send	**SEND AS '#'**
MSI/Plessey	Don't Send	**SEND AS '@'**

Appendix A
Std. Defaults

IBM Interfaces

Send as Code 39[1]

Symbology	Enable	**DISABLE**

Limit Command Set

Ignore Some Host Commands	Enable	**DISABLE**

Transmit Unsolicited Status

IBM 4683/84 4693/94 Port 5B	**ENABLE**	Disable
IBM 4683/84 4693/94 Port 9A, 9B, 9C, 9E	Enable	**DISABLE**
IBM 4682/92 Port E	Enable	**DISABLE**

1 Converts UPC/EAN Add-ons, Code 128, Code 93, Codabar and MSI/Plessey barcode data into Code 39 format before sending data to host.

Appendix B
Additional Information

Host Programming

Some interfaces and host systems include the ability to configure the scanner by sending commands to the scanner.

Creating MultiFunction Labels

The term, multifunction label, describes a programming label that contains multiple programming features in one programming label. These labels can be created with label making software that supports Code 128.

Need More Information

If you require more information about using your host system to change the scanner's programmable features or detailed instructions about creating multifunction labels, contact your local dealer or distributor or call (in the U.S. or Canada) Spectra-Physics Technical Support at 1-800-547-2507.

If you have specific comments about the contents of this Programming Guide or any other technical literature distributed by Spectra-Physics, call the 1-800 number and ask for extension 3541.

Appendix C
Sample Barcodes

CODE 128

Code 128.Test

CODE 39

Code 39.Test

INTERLEAVED 2 OF 5

0123456789

STANDARD 2 OF 5

0123456789

CODABAR

$99.95

CODE 93

Code 93.Test

UPC-A

0 00112 23344

UPC-A w/2 digit Add-on

0 60992 01118 49

UPC-A w/ 5 digit Add-on

0 08029 51041 69000

UPC-E

0 998875

EAN-8

0021 0126

EAN-13

1 101234 567891

MSI/Plessey

14476925

NOTES

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